Paper No. 16

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Ex parte D. MORGAN TENCH,
JOHN T. WHITE,
DIETER DORNISCH,
and
MAUREEN BRONGO

Appeal No. 2002-0730
Application No. 09/410,250

ON BRIEF

Before LIEBERMAN, JEFFREY T. SMITH, and POTEATE, Administrative Patent Judges.

LIEBERMAN, Administrative Patent Judge.

DECISION ON APPEAL

This is an appeal under 35 U.S.C. § 134 from the rejection of the examiner refusing to allow claims 1 through 8 and 10 through 28, which are all the claims pending in this application, other than claims 29 and 30 which have been withdrawn from consideration.

THE INVENTION

The invention is directed to an electrolytic solution for electroplating copper in trenches and vias in dielectric material on semiconductor chips. The electrolytic solution comprises water, copper in the +1 or +2 oxidation state, anions that form at least one complex anion with copper, and at least one organic additive which tends to further suppress the copper deposition rate. In a second embodiment, the invention is further directed to a process for electroplating copper circuitry in trenches and vias in dielectric material on semiconductor chips utilizing the electrolytic solution of the first embodiment. Additional limitations are provided in the following illustrative claims.

THE CLAIMS

Claims 1 and 15 are illustrative of appellants' invention and are reproduced below:

1. An electrolytic solution for electroplating copper circuitry in trenches and vias in dielectric material on semiconductor chips, comprising:

water as a solvent,

copper in either the +1 or +2 oxidation state or a mixture of the two states,

anions that form at least one complex ion with said copper so as to significantly increase the overvoltage for copper electrodeposition such that the copper deposition rate at a given cathode voltage is suppressed, and

at least one organic additive species which tends to further suppress the copper deposition rate so as to provide the rate differential needed to provide bottom-up filling of said trenches and vias,

wherein said electrolytic solution is used for electroplating copper circuitry in trenches and vias in dielectric material on semiconductor chips.

15. A process for electroplating copper circuitry in trenches and vias in dielectric material on semiconductor chips, comprising:

providing a semiconductor chip which includes dielectric material in which trenches and/or vias have been formed,

placing said chip in contact with an electroplating solution, said solution comprising:

water as a solvent,

copper in either the +1 or +2 oxidation state or a mixture of the two states,

anions that form at least one complex ion with said copper so as to significantly increase the overvoltage for copper electrodeposition such that the copper deposition rate at a given cathode voltage is suppressed, and

at least one organic additive species which tends to further suppress the copper deposition rate so as to provide the rate differential needed to provide bottom-up filling of said trenches and/or vias, and

electrodepositing copper in said trenches and/or vias.

THE REFERENCES OF RECORD

As evidence of anticipation and obviousness the examiner relies upon the following references:

Lyde	3,674,660	Jul. 4, 1972
Morrissey et al. (Morrissey)	4,683,036	Jul. 28, 1987
Dubin et al. (Dubin)	5,972,192	Oct. 26, 1999 (Filed July 23, 1997)

THE REJECTIONS

Claims 1 through 6 and 10 through 13 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Lyde.

Claims 1, 7 and 8 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Morrissey.

Claim 14 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Lyde in view of Morrissey.

Claims 15 through 17 and 23 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Dubin.

Claims 21, 22 and 28 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Dubin in view of Morrissey.

Claims 18 through 20 and 24 through 27 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Dubin in view of Lyde.

OPINION

We have carefully considered all of the arguments advanced by the appellants and the examiner and agree with the examiner that the rejection on the grounds of anticipation and obviousness over Lyde or Morrissey alone or in combination are well founded. Accordingly, we affirm these rejections. We agree with the appellants that the rejections

on the grounds of anticipation and obviousness over Dubin alone or in view of Morrissey or Lyde are not well founded. Accordingly, we reverse these rejections.

As an initial matter the appellants have stated that, "[t]hese claims do not stand or fall together." See Brief, page 5. The argument before us however, presents a single issue with respect to claims 1 through 8 and 10 through 14 directed to the electrolytic solution, and a separate argument with respect to claims 15 through 28 directed to a process for electroplating. Accordingly, we focus primarily on claims 1 and 15 and briefly address claims 14, 18 and 21 as they are representative of separate rejections of record and limit our consideration thereto. See 37 CFR §1.192(c)(7) (2001).

Rejection under 35 U.S.C. Section 102(b) over Lyde or Morrissey

It is the basic premise of the appellants that, "applicants do not claim to have invented highly complexed copper plating baths; rather, they have discovered an important new utility for such a bath. The applicants were the first to recognize that highly complexed copper plating baths, prepared in accordance with the specification and as recited in the present claims, offer significant advantages for copper chip plating." See Brief, page 7.

Indeed in order to clarify the differences over the prior art, the appellants required that the electrolytic solution of claim 1 be used for a particular purpose, "electroplating copper circuitry in trenches and vias in dielectric material on semiconductor chips." See

claim 1. The principal issue before is whether the aforesaid limitation distinguishes the claimed electrolytic solution over the prior art admittedly directed to an electrolytic solution having the same composition.

It is well settled that, "[i]f, however, the body of the claim fully and intrinsically sets forth the complete invention, including all of its limitations, and the preamble offers no distinct definition of any of the claimed invention's limitations, but rather merely states, for example, the purpose or intended use of the invention, then the preamble is of no significance to claim construction because it cannot be said to constitute or explain a claim limitation." See Pitney Bowes, Inc. v. Hewlett-Packard Co., 182 F.3d 1298, 1305, 51 USPQ2d 1161, 1165-66 (Fed. Cir. 1999). See also Rowe v. Dror, 112 F.3d 473, 478, 42 USPQ2d 1550, 1553 (Fed. Cir. 1997) ("where a patentee defines a structurally complete invention in the claim body and uses the preamble only to state a purpose or intended use for the invention, the preamble is not a claim limitation"). We conclude that the preamble to claim 1, "for electroplating copper circuitry in trenches and vias in dielectric material on semiconductor chips," falls within the specific area wherein the preamble states a purpose or intended use of the invention. Accordingly, It cannot be construed as constituting or explaining a claim limitation.

Neither are we convinced by appellants' argument that, "the existing literature clearly teaches away from the use of a bath such as that described in Morrissey for chip

plating." See Brief, page 8. The rejection before us is one of anticipation. The art of record to Lyde and Morrissey either anticipates the invention or not. An argument that existing literature teaches away from the use of such a bath for chip plating is unpersuasive inasmuch as the "teaching away" is only from the ultimate intended utility and not to the electrolytic solution which the appellants admit lacks novelty.

Similarly, with respect to the rejection over Morrissey, the appellants have argued that, "Morrissey is specifically directed to a method of electroplating non-metallic surfaces such as the plated-through-holes of printed wiring boards (PWBs). As with the patent to Lyde, Morrissey does not disclose, describe, or contemplate the electroplating of semiconductor chips." See Brief, page 7. For the reasons stated above, we find this argument no more persuasive than the previous arguments. The claimed subject matter is directed to "an electrolytic solution" which solution is not novel.

In light of the aforesaid analysis we conclude that the rejections on the grounds of anticipation of the "electrolytic solution" are sustained. We also sustain the rejection of claim 14 as the sole argument offered by the appellants in that it is allowable as claim 1 is allowable.

Rejection under Section 102(b) over Dubin

In contrast to the electrolytic solution of the first embodiment, claim 15 is directed to, "'a process for electroplating copper circuitry in trenches and vias in dielectric material on semiconductor chips.'" See Brief, page 9.

In order for a claimed invention to be anticipated under 35 U.S.C. § 102(b), all of the elements of the claim must be found in one reference. Scripps Clinic & Research Found. v. Genentech Inc., 927 F.2d 1565, 1576, 18 USPQ2d 1001, 1010 (Fed. Cir. 1991). The examiner relies upon a reference to Dubin to reject the claimed subject matter and establish a prima facie case of anticipation.

Dubin is directed to a method of filling an opening in a dielectric layer by electroplating copper therein. See column 1, lines 5-7. A leveling agent which is an organic additive is employed in the invention. See column 6, lines 15-23. The presence of the leveling agent results in the electroplating solution plating at the bottom of the opening and thereafter sequentially to the top of the opening. See column 6, lines 46-49. The copper is supplied as a copper sulfate solution with chloride anions present to improve anode dissolution. It is appellants' position that chloride ion, although present in the solution, is not present in a sufficient amount to form a complex ion with the copper as required by the claimed subject matter. We agree. Although Dubin clearly discloses that some chloride ion is present in the copper sulfate solution in the presence of sulfuric acid, it

is not evident from the teachings of Dubin that the amount of chloride ion present in Dubin is sufficient to meet the requirement that "anions that form at least one complex ion with said copper so as to significantly increase the overvoltage for copper electrodeposition such that the copper deposition rate at a given cathode voltage is suppressed." See claim 15.

Inasmuch as the burden of proof is on the examiner to establish a prima facie case of anticipation, the mere finding by the examiner that chloride ions are present is not sufficient to suggest or teach that the amount present in the environment disclosed by Dubin is either sufficient to form a complex ion with the copper or significantly increase the overvoltage. Accordingly, the examiner has failed to establish a prima facie case of anticipation. Neither do the rejections under Section 103(a) in view of Morrissey or Lyde remedy this defect as the references are not relied upon in the rejection of claim 15 to teach the requisite amount of chloride ion and the examiner has not presented any findings or argued that either Morrissey or Lyde teaches or suggest the requisite chloride content needed to meet the requirements of claim 15.

DECISION

The rejection of claims 1 through 6 and 10 through 13 under 35 U.S.C. § 102(b) as being anticipated by Lyde is affirmed.

The rejection of claims 1, 7, and 8 under 35 U.S.C. § 102(b) as being anticipated by Morrissey is affirmed.

The rejection of claim 14 under 35 U.S.C. § 103(a) as being unpatentable over Lyde in view of Morrissey is affirmed.

The rejection of claims 15 through 17 and 23 under 35 U.S.C. § 102(e) as being anticipated by Dubin is reversed.

The rejection of claims 21, 22, and 28 under 35 U.S.C. § 103(a) as being unpatentable over Dubin in view of Morrissey is reversed.

The rejection of claims 18 through 20 and 24 through 27 under 35 U.S.C. § 103(a) as being unpatentable over Dubin in view of Lyde is reversed.

The decision of the examiner is affirmed-in-part

No time period for taking any subsequent action in connection with this appeal may be extended under 37 CFR § 1.136(a).

AFFIRMED-IN-PART

PAUL LIEBERMAN Administrative Patent Judge	)
JEFFREY T. SMITH Administrative Patent Judge	) BOARD OF PATENT) APPEALS) AND) INTERFERENCES
LINDA R. POTEATE Administrative Patent Judge	)

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